ESITHOUGHTLAB

Smart City Solutions for a Riskier World

Regional scorecards

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Research background

Research scope and methodology

COVID-19 has accelerated the need for cities around the world to adopt innovative solutions to achieve their social, environmental, and economic goals. But the priorities and solutions vary by region—and within regions, based on a city's population size, development maturity, and other factors.

To help city leaders compare their practices and progress against those of peers, ESI ThoughtLab has collaborated with a global coalition of business, government, and academic leaders to conduct a comprehensive benchmarking study on 167 cities across six world regions: Africa, Asia Pacific, Europe, Latin America, Middle East, and North America.

Titled **Smart City Solutions for a Riskier World**, this study covers cities across 82 countries, with various income levels and population sizes—representing nearly 7% of the global population.

Using the UN's 17 Sustainable Development Goals as the analytical framework, the research examines how cities across regions have leveraged digital technologies and data, together with public-private partnerships and policy initiatives, to achieve the SDGs. This report outlines those solutions, and which work best by region.

167 Cities

82 Countries

526.8 million residents

6.8% of global population

The three stages of SDG progress

A prime objective of this research was to assess how smart urban solutions such as digital technologies and partnerships can help cities achieve the SDGs. To measure the progress that cities have made in driving the SDGs, we developed an SDG progress framework.

Our framework categorizes cities into three groups: implementers, which are in an early stage of SDG adoption; advancers, which are making progress on a range of SDGs; and sprinters, which are making fast progress on most areas of sustainable development. Twenty percent of cities are classified as implementers, 58% as advancers, and 22% as sprinters.
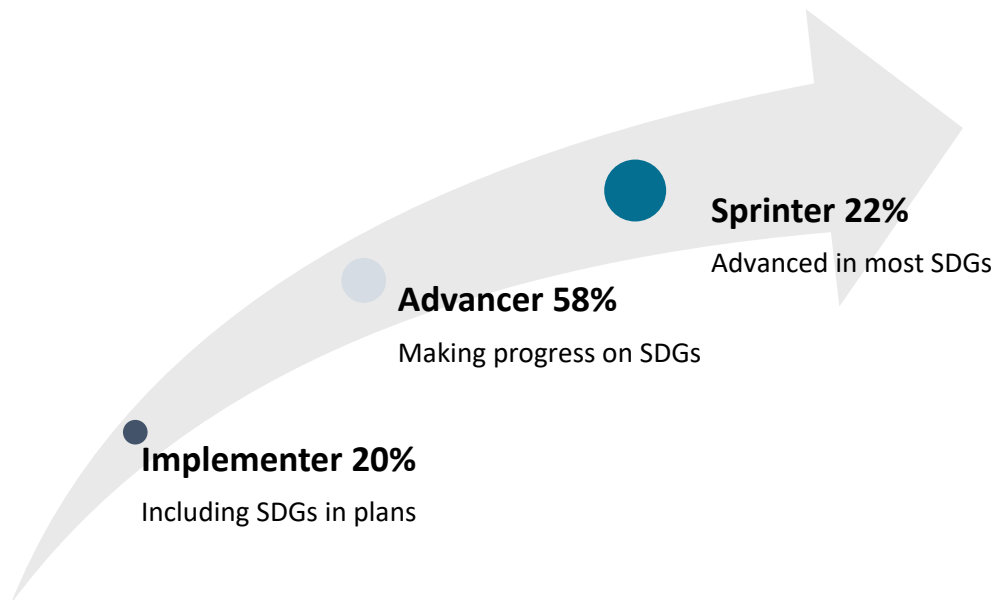
Our SDG progress framework

We categorized each city into three stages of sustainable development progress: implementers, advancers, and sprinters. Our economists classified cities based on their scores across the following criteria:

1. The number of SDGs a city has included in its plans

2. The progress a city has made on each of the SDGs

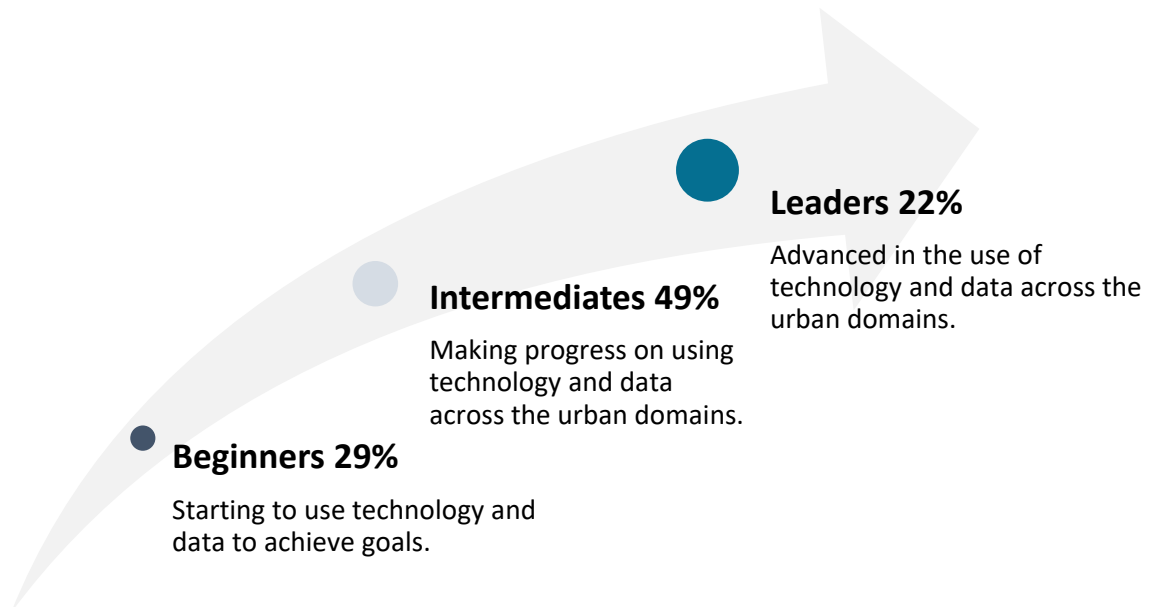**3. The steps a city is takes to achieve the SDGs:**

- Regularly monitors SDG efforts
- Assesses areas where the city lags
- Designates a department to implement SDGs
- Gathers high-level support for their SDG program
- Conducts a voluntary local review (VLR)
- Enjoys a reputation as a leader in SDG adoption

Sprinter 22%
Advanced in most SDGs

Advancer 58%
Making progress on SDGs

Implementer 20%
Including SDGs in plans

Classifying smart city maturity

Our economists also created a smart city maturity framework to assess which cities are ahead in using digital solutions and technologies to achieve their social, environmental, and economic goals. We classified cities based on their progress on harnessing technology and data across the urban domains, as well as their ability to foster citizen and stakeholder engagement. Twenty-nine percent of cities are classified as implementers, 49% as advancers, and 22% as smart city leaders.

Some cities are ahead in both SDG progress and smart innovation. We have classified these as Cities 4.0. There are 20 such cities in our survey.

The following regional scorecards present a snapshot of the smart, sustainable solutions used to drive progress in six regions of the world.

Leaders 22%

Advanced in the use of technology and data across the urban domains.

Intermediates 49%

Making progress on using technology and data across the urban domains.

Beginners 29%

Starting to use technology and data to achieve goals.

Our smart city maturity framework

We categorized each city into one of three stages of smart city maturity: beginners, intermediates, and leaders. Our economists classified cities based on scores across the following criteria:

1. Level of digitization across the urban domains

2. Competence in using data and analytics

3. Progress on fostering citizen engagement

We applied an additional filter for leaders. To be classified as a leader, a city had to self-identify as either advanced or very advanced in its implementation of smart city initiatives.

Regional scorecards

Africa SDG scorecard

Operating in developing countries with challenging social, sustainability, and economic issues, African cities struggle more with the SDGs than those in advanced economies. Just 58% of African cities have adopted the SDGs framework into their plans (only Asian cities are lower), and only 31% on average report notable progress on their goals—the lowest of any region.

With rising temperatures and sea levels threatening their citizens and economies, it is not surprising that African cities are moving most aggressively on climate action. They are also making moderate advances on partnerships, education, poverty, health, gender equality, decent work, and life on land.

Notably, one African city, Accra, stands out as a sprinter within our SDG maturity framework. It has made more headway on the SDGs, has adopted several SDG best practices, and has taken an innovative approach to funding.

Average ROI

Safety & security	Energy & water	Environment
Facial recognition & biometrics **7.15%**	Data & analytics **7.50%**	Real-time air quality monitoring **4.73%**
Data & central control centers **5.90%**	Real-time water network monitoring **5.69%**	Real-time water quality monitoring **4.33%**
Communication systems **5.37%**	Smart grids/smart meters **5.17%**	Data to optimize waste collection **3.33%**

Most progress on SDGs

Climate action	Partnerships for the goals	Education; no poverty; health; gender equality; decent work; life on land
58%	**47%**	**42%**

Least progress on SDGs

Affordable & clean energy	Clean water	Industry, innovation; peace & justice; sustainable cities
0%	**11%**	**16%**

Key partnerships in 3 years		Top domain investments in 3 years	
Multilaterals	**58%**	Environment	**37%**
Federal government	**58%**	Mobility & transportation	**28%**
Regional agencies	**53%**	Energy; economy	**26%**

Top SDG funding now		Top SDG funding In 3 years	
Government based	**89%**	Government based	**79%**
Public funding & grants	**79%**	Private-sector financing	**58%**
Private-sector financing	**58%**	Multilateral	**58%**

Top SDG challenges next 3 years

53%
Weak economy/high unemployment

47%
High costs & budgetary constraints

37%
High cost of digital connectivity

37%
Fast pace of technological change

37%
Complex policies & regulations

Africa Smart scorecard

With their more limited resources, cities in Africa invest less than others across all technologies and solutions. They have the second smallest average technology budget (after Latin American cities)—just $5.6m annually. Interestingly, as they boost their investments over the next three years, they hope to modestly overtake cities in Asia.

Despite small digital budgets, African cities are making large investments in a few technologies, notably mobile, biometrics, IoT, and cloud. No African city reports making big outlays in the more rarefied technologies such as drones, augmented reality, digital twins, and 3-D printing.

Africa is the only region with no city that is well prepared for cyberattacks, and it trails all others in plans to invest in cybersecurity over the next three years. Furthermore, African cities are the least advanced in using data, and are the furthest behind in using digital solutions and other practices to engage their citizens.

Under our smart city maturity framework, 13 African cities are in the beginner stage, while six are intermediates. None is a leader.

Biggest investments now		Biggest increase over next 3 years	
Mobile, apps	**95%**	Digital platforms	**+42%**
Biometrics	**74%**	Digital dashboards	**+37%**
IoT	**68%**	Data warehouses, lakes	**+32%**
Cloud	**68%**	Blockchain	**+31%**
Telematics; RPA; and AI	**47%**	Drones, robots	**+21%**

Average annual tech budget

Large city: $14.6m

Small city: $0.9m

Average $5.6m

Average ROI on digital infrastructure investments

Municipal broadband 6.37%
Cloud 6.23%
Low-powered WANs 6%
Smart streetlights 5.92%
Data centers 5.63%
Smart stations 5.57%
IoT 4.62%
Public Wi-Fi 4.83%
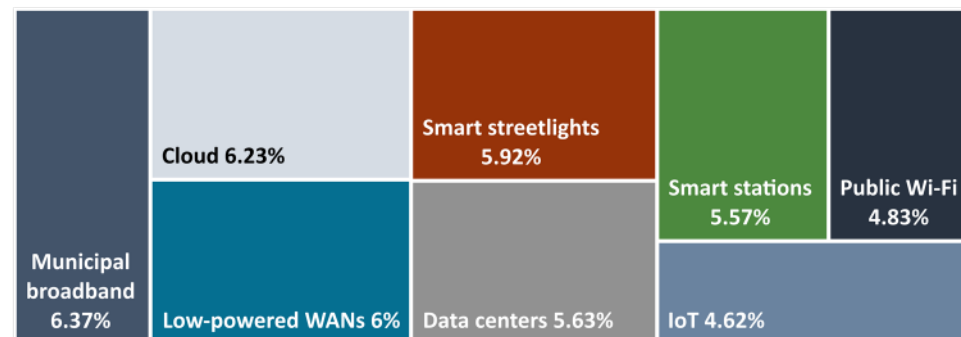
Data most used now		Biggest rise in data in 3 years	
Citizen satisfaction	**58%**	Predictive	**+42%**
Administrative	**58%**	Behavioral	**+26%**
IoT	**53%**	Channel usage	**+21%**
Business	**47%**	Real-time	**+21%**
Citizen usage data	**42%**	Supply chain	**+6%**

Africa behind in engaging citizens	All cities	Africa	Diff.
Using digital communication	72%	37%	-35%
Using gamification	46%	21%	-25%
Appointing Chief Citizen Experience Officer	12%	0%	-12%
Having citizens help set goals	49%	37%	-12%
Personalizing digital platforms	53%	62%	-9%

Africa City indicators

City	SDG in plans	SDG progress	Tracks SDGs	SDG department	Smart city maturity
Accra	Yes	**Sprinter**	Yes	Yes	Intermediate
Addis Ababa	Yes	Advancer	Yes	Yes	Intermediate
Bamako	No	Implementer	No	No	Beginner
Benin City	No	Implementer	No	No	Beginner
Blantyre	Yes	Implementer	No	No	Beginner
Cotonou	Yes	Implementer	No	No	Beginner
Dar es Salaam	No	Implementer	No	No	Beginner
Ekurhuleni	Yes	Advancer	Yes	Yes	Intermediate
Harare	No	Implementer	No	No	Intermediate
Ibadan	No	Implementer	No	No	Beginner
Kampala	Yes	Implementer	No	No	Beginner
Kano	Yes	Implementer	Yes	No	Intermediate
Kigali	Yes	Advancer	No	No	Beginner
Kinshasa	Yes	Implementer	No	No	Intermediate
Lagos	No	Implementer	No	No	Beginner
Libreville	No	Implementer	No	No	Beginner
Lusaka	No	Implementer	No	No	Beginner
Monrovia	Yes	Implementer	No	No	Beginner
Touba	Yes	Advancer	Yes	No	Beginner

Cities 4.0 are highlighted in gray

Asia Pacific SDG scorecard

Cities in APAC are behind those in other regions in advancing their SDG agendas. Just 50% have incorporated the SDG framework into their plans, and only 58% have made considerable headway on the SDGs. In comparison, 90% or more of cities in other regions, except Africa, have adopted the SDGs.

Still, APAC cities have forged ahead in some key areas. An admirable 96% have made significant progress on eliminating poverty, while around three-quarters have made good progress on quality education, and meeting work and economic growth goals. However, gender inequality remains a major challenge, underscored by the region's relatively high levels of domestic violence, unsafe work, and judicial discrimination.

Within our SDG progress framework, five Asian cities—Mumbai, Osaka, Singapore, Suzhou, and Tokyo—qualify as sprinters. Fifteen are early-stage implementers and 27 are advancers.

Average ROI

Safety & security	Energy & water	Environment
Data-sharing systems for agencies **6.70%**	Apps to track energy use **5.60%**	Real-time air quality monitoring **4.94%**
Data-driven policing **6.50%**	Apps to track water usage **5.58%**	Real-time water quality monitoring **4.85%**
Central control centers gathering data **5.77%**	Smart water meters **5.56%**	Data to optimize water collection routes **3.33%**

Most progress on SDGs

No poverty	Quality education	Decent work & economic growth
96%	**72%**	**74%**

Least progress on SDGs

Gender equality	Peace & justice	Partnerships for the goals
33%	**35%**	**38%**

Key partnerships in 3 years		Top domain investments in 3 years	
Federal government	**59%**	Living & health	**57%**
Regional agencies	**54%**	Mobility & transportation	**54%**
Consultants, outsourcing	**50%**	Digital infrastructure	**54%**

Top SDG funding now		Top SDG funding In 3 years	
Private-sector financing	**89%**	Private-section financing	**61%**
Government based	**76%**	Government based	**59%**
Public funding & grants	**59%**	Multilateral, development	**52%**

Top SDG challenges next 3 years

52%
Finding right partners, suppliers

41%
Data security & privacy

39%
Fast pace of digital change

30%
Complex policies & regulations

28%
Coordinating across departments

Asia Pacific Smart scorecard

APAC cities are behind those in North America and Europe in their smart innovation investments. They have a far smaller average budget for smart technologies ($16.3m) than North American cities ($33.2m) and European cities ($29.8m).

Currently, APAC cities spend the most on cloud, IoT, AI, mobile, and digital platforms. Over the next three years, they will make bigger investments in other specialized solutions, such as blockchain, drones, and data warehouses. Given the leadership role of Japan, South Korea, and China in additive manufacturing, it is no wonder that cities there are making larger investments in 3D printing than in other regions.

Asian cities also lag their North American and European counterparts in their readiness for cyberattacks, with just 38% reporting they are well or very prepared. Yet they are aware of the need to catch up: more APAC cities plan to make large outlays in cybersecurity over the next three years than cities in any other region.

Three cities—Auckland, Seoul, and Singapore—are designated as smart city leaders, 23 as intermediates, and 24 as beginners. Singapore stands out as a City 4.0: one that leads in both the SDGs and in smart technology.

Biggest investments now		Biggest increase over next 3 years	
Cloud	74%	Blockchain	+24%
IoT	72%	Drones, other	+20%
AI	67%	Data warehouses, lakes	+13%
Mobile, apps	65%	Digital dashboards	+13%
Digital platform	54%	Telematics	+11%

Average annual tech budget

Large city: $27.7m

Small city: $11.6m

Average: $16.3m

Average ROI on digital infrastructure investments

V2X, 7.50%	Mesh networ… 7.17%	Public Wi-Fi , 6.95%	IoT, 6.60%	Smart stations, 5.58%	Cloud , 6.28%
					Data centers, 5.47%
					Smart streetlights, 5.43%
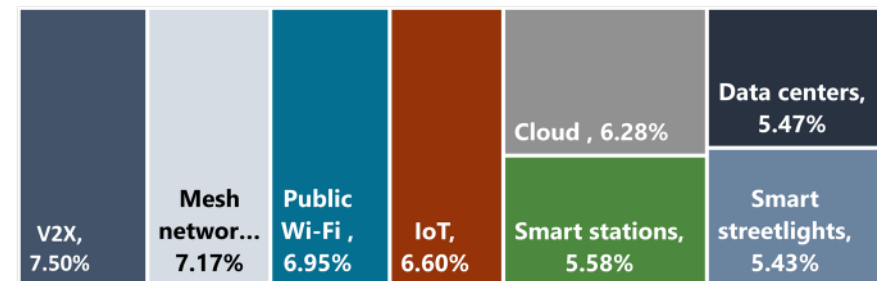
Data most used now		Biggest rise in data in 3 years	
Administrative	83%	Predictive	+28%
Citizen satisfaction	59%	Behavioral	+20%
IoT	57%	Peer-based	+17%
Citizen usage	54%	Geospatial	+11%
Real-time	52%	IoT	+8%

APAC lags in citizen engagement	All cities	APAC	Diff.
Personalizing digital platforms	52%	62%	-10%
Involving disadvantaged	49%	39%	-10%
Having citizens help set goals	49%	39%	-10%
Demonstrating value	47%	37%	-10%
Using gamification	46%	39%	-7%

Asia Pacific City indicators

City	SDG in plans	SDG progress	Tracks SDGs	SDG department	Smart city maturity
Adelaide	Yes	Advancer	Yes	Yes	Intermediate
Ahmedabad	Yes	Advancer	Yes	Yes	Beginner
Auckland	Yes	Advancer	Yes	Yes	**Leader**
Bangkok	Yes	Advancer	Yes	No	Beginner
Beijing	No	Advancer	Yes	No	Intermediate
Busan-Ulsan	Yes	Advancer	Yes	Yes	Intermediate
Canberra	Yes	Advancer	Yes	No	Intermediate
Changchun	No	Implementer	No	No	Beginner
Chengdu	No	Advancer	No	Yes	Intermediate
Chennai	Yes	Advancer	Yes	No	Intermediate
Chongqing	No	Implementer	No	No	Beginner
Dalian	No	Implementer	No	No	Beginner
Dehradun	Yes	Advancer	Yes	No	Beginner
Fukuoka	Yes	Advancer	Yes	Yes	Intermediate
Guiyang	No	Implementer	No	No	Intermediate
Hangzhou	No	Advancer	No	No	Beginner
Hanoi	Yes	Advancer	Yes	Yes	Intermediate
Hefei	No	Implementer	No	No	Intermediate
Jaipur	No	Implementer	No	No	Beginner
Jakarta	Yes	Advancer	No	No	Intermediate
Jiaozuo	No	Implementer	No	No	Intermediate
Jinan	No	Implementer	No	No	Beginner
Kochi	Yes	Implementer	Yes	No	Beginner

City	SDG in plans	SDG progress	Tracks SDGs	SDG department	Smart city maturity
Kuala Lumpur	Yes	Advancer	No	No	Intermediate
Lahore	No	Implementer	No	No	Beginner
Lucknow	Yes	Advancer	Yes	Yes	Intermediate
Ludhiana	No	Advancer	No	No	Intermediate
Manila	No	Advancer	No	No	Intermediate
Mumbai	Yes	**Sprinter**	Yes	Yes	Intermediate
Nanjing	No	Advancer	No	No	Intermediate
Ningbo	No	Advancer	No	No	Beginner
Osaka	Yes	**Sprinter**	Yes	Yes	Intermediate
Phnom Penh	Yes	Advancer	No	No	Beginner
Pune	No	Implementer	No	No	Intermediate
Qingdao	No	Implementer	No	No	Beginner
Quezon City	Yes	Advancer	Yes	No	Beginner
Seoul	Yes	Advancer	Yes	Yes	**Leader**
Shanghai	No	Advancer	Yes	No	Intermediate
Singapore	Yes	**Sprinter**	Yes	Yes	**Leader**
Suzhou	No	**Sprinter**	Yes	Yes	Intermediate
Tianjin	No	Implementer	No	No	Beginner
Tokyo	Yes	**Sprinter**	Yes	No	Intermediate
Toyama	Yes	Implementer	Yes	No	Beginner
Wuhan	No	Advancer	No	No	Beginner
Xiamen	No	Advancer	Yes	No	Beginner
Yangon	Yes	Implementer	No	No	Beginner

Cities 4.0 are highlighted in gray

Europe SDG scorecard

European cities have made the most progress on achieving the SDGs of any region, with 77% of cities on average having advanced considerably on their goals. Ninety-two percent have incorporated the SDG into their plans.

European cities have made the most impressive gains in the SDGs centered on health and well-being, decent work and economic growth, and sustainable cities and communities. Even in areas where they have made the least progress, such as reduced inequalities and climate action, they are ahead of cities in other regions. It is especially noteworthy how far ahead they are of North American cities on climate action, which are at the very bottom of the pack.

Europe boasts the largest number of sprinter cities in the survey, with 16, double the number in North America. Another 19 cities are advancers. Reflecting the regional commitment to the SDGs, only one European city, Jena, is classified as an implementer, in the earliest stage of SDG development.

Most progress on SDGs

Health & well-being	Decent work & economic growth	Sustainable cities
95%	**92%**	**86%**

Least progress on SDGs

Life below water	Climate action	Reduced inequalities
49%	**65%**	**68%**

Average ROI

Safety & security	Energy & water	Environment
Data-driven policing **6.70%**	Smart water meters **6.81%**	Data to optimize waste collection **6.53%**
Facial recognition & biometrics **6.61%**	Smart grids/smart meters **6.02%**	Real-time air quality monitoring **5.87%**
Early warning systems & digital twins **6.53%**	Apps to track energy use **5.51%**	Real-time water quality monitoring **5.57%**

Key partnerships in 3 years		Top domain investments in 3 years	
Federal government	**70%**	Digital infrastructure	**78%**
Regional agencies	**65%**	Living & health	**76%**
State/provincial government	**59%**	Environment	**76%**

Top SDG funding now		Top SDG funding In 3 years	
Private-sector financing	**94%**	Private-sector financing	**86%**
Government based	**94%**	Government based	**77%**
Public funding & grants	**57%**	Crowdfunding from public	**77%**

Top SDG challenges next 3 years

62%
Complex policies & regulations

49%
Finding right suppliers, partners

49%
Data security & privacy

43%
Need to focus on basic services

35%
Coordinating across city departments

Europe Smart scorecard

European cities have the second-largest average technology budgets (after their North American counterparts), at $29.8m. Every European municipality has made a large investment in the cloud, and over 90% have done so in mobile, biometrics, and IoT. Over the next three years, European cities will increase investments most in digital twins, AI, data warehouses, and online collaborative tools.

Cities in Europe are also second to those in North America in preparedness for cyberattacks: 54% are well or very well prepared (vs. 58% of North American cities). With a continued eye on cyber threats, they will boost cybersecurity spending only slightly less than North American cities over the next three years.

Europe has the highest number of smart city leaders in our study, with 18. It has 13 intermediate cities and six beginners. Thirteen also qualify as Cities 4.0, ahead in both SDG progress and smart innovation. Reflecting the digital sophistication of European cities, they are also posting the highest average ROI on their technology investments to achieve the SDGs.

Biggest investments now		Biggest increase over next 3 years	
Cloud	**100%**	Digital twins	**+38%**
Mobile, apps	**97%**	AI	**+29%**
Biometrics	**97%**	Data warehouse, lakes	**+19%**
IoT	**95%**	Online collaborative tools	**+16%**
Blockchain	**81%**	AR/VR	**+14%**

Average annual tech budget

Large city: $40.5m

Small city: $18.6m

Average: $29.8 m

Average ROI on digital infrastructure investments

Smart stations, 6.71% | Public Wi-Fi, 6.58% | Municipal broadband, 6.32% | IoT, 5.87%
Smart streetlights, 6.65% | Cloud technology, 6.53% | Mesh networks, 6.00% | Data centers, 5.17%

Data most used now		Biggest rise in data in 3 years	
IoT	95%	Channel usage	**+40%**
Citizen usage	81%	Predictive	**+35%**
Administrative	78%	Business	**+24%**
Citizen satisfaction	59%	Peer-based	**+22%**
Real-time	59%	Crowd-sourced	**+22%**

Europe is ahead in engaging citizens	All cities	Europe	Diff.
Personalizing digital platforms	62%	81%	19%
Using gamification	46%	59%	13%
Using digital communications	72%	84%	12%
Demonstrating value	47%	57%	10%
Involving disadvantaged	49%	59%	10%

Europe City indicators

City	SDG in plans	SDG progress	Tracks SDGs	SDG department	Smart City maturity
Aarhus	Yes	**Sprinter**	Yes	Yes	**Leader**
Almaty	No	Advancer	No	No	Beginner
Amsterdam	Yes	Advancer	Yes	Yes	**Leader**
Athens	Yes	**Sprinter**	Yes	Yes	**Leader**
Barcelona	Yes	**Sprinter**	Yes	Yes	**Leader**
Belgrade	Yes	Advancer	Yes	Yes	Intermediate
Berlin	Yes	**Sprinter**	Yes	Yes	**Leader**
Birmingham	Yes	**Sprinter**	Yes	Yes	**Leader**
Bratislava	Yes	**Sprinter**	Yes	Yes	Intermediate
Bucharest	Yes	Advancer	Yes	Yes	Intermediate
Copenhagen	Yes	**Sprinter**	Yes	Yes	**Leader**
Dublin	Yes	Advancer	Yes	Yes	**Leader**
Galway	Yes	Advancer	Yes	No	Beginner
Helsinki	Yes	**Sprinter**	No	No	**Leader**
Istanbul	Yes	Advancer	Yes	Yes	**Leader**
Jena	No	Implementer	No	No	Beginner
Kyiv	Yes	**Sprinter**	Yes	Yes	Intermediate
Liege	Yes	Advancer	Yes	Yes	Beginner
Lisbon	Yes	Advancer	Yes	No	Intermediate

City	SDG in plans	SDG progress	Tracks SDGs	SDG department	Smart City maturity
Ljubljana	Yes	Advancer	Yes	Yes	Intermediate
London	Yes	**Sprinter**	Yes	Yes	**Leader**
Madrid	Yes	**Sprinter**	Yes	No	**Leader**
Mariupol	No	Advancer	No	No	Beginner
Moscow	Yes	**Sprinter**	Yes	No	**Leader**
Munich	Yes	Advancer	Yes	No	Intermediate
Oslo	Yes	Advancer	Yes	Yes	Intermediate
Paris	Yes	**Sprinter**	Yes	Yes	**Leader**
Porto	Yes	Advancer	Yes	Yes	Intermediate
Prague	Yes	Advancer	Yes	Yes	**Leader**
Reykjavik	Yes	Advancer	Yes	Yes	Intermediate
Rotterdam	Yes	Advancer	Yes	Yes	**Leader**
St Petersburg	Yes	Advancer	Yes	No	Intermediate
Stockholm	Yes	**Sprinter**	Yes	Yes	Intermediate
Tallinn	Yes	**Sprinter**	Yes	Yes	**Leader**
Tbilisi	Yes	Advancer	Yes	Yes	Beginner
Vienna	Yes	**Sprinter**	Yes	Yes	**Leader**
Warsaw	Yes	Advancer	Yes	Yes	Intermediate

Cities 4.0 are highlighted in gray

Latin America SDG scorecard

After Africa, Latin America has advanced the least in achieving the SDGs: only 47% of cities on average report having made considerable progress across the 17 goals. But 93% of cities have built the SDG framework into their plans, showing their commitment.

Latin American cities have made the most progress in reducing poverty, a product of social welfare policies adopted by governments around the region to address this chronic problem. After poverty alleviation, they have made the most headway on sustainable cities, responsible consumption, and gender equality.

With five sprinter cities, Latin America has more than Africa or MENA. Only one Latin American city surveyed (San Juan) is in the earliest, implementer stage of SDG development.

Average ROI

Safety & security	Energy & water	Environment
Crowdsourced crime reporting apps **7.10%**	Smart grids/smart meters **7.05%**	Real-time water quality monitoring **6.94%**
Drones & aerial surveillance **6.21%**	Apps to track energy use **6.46%**	Real-time air quality monitoring **6.39%**
Facial recognition & biometrics **6.11%**	Microgrids/distributed generation **5.87%**	Predictive analytics for flood warning **3.50%**

Most progress on SDGs

No poverty	Sustainable cities	Responsible consumption; gender equality
87%	**60%**	**60%**

Least progress on SDGs

Reduced inequalities	Industry, innovation	Life on land; peace/justice institutions
20%	**27%**	**27%**

Key partnerships in 3 years		Top domain investments in 3 years	
Regional agencies	**93%**	Living & health	**60%**
Federal government	**87%**	Environment & sustainability	**87%**
State/provincial government	**80%**	Public safety; mobility; energy	**80%**

Top SDG funding now		Top SDG funding in 3 years	
Private-sector financing	**93%**	Private-sector financing	**73%**
Public funding & grants	**80%**	Government based	**73%**
Government based	**80%**	Crowdfunding from public	**67%**

Top SDG challenges next 3 years

53%
Finding right partner or supplier

53%
Complex policies & regulations

47%
Data security & privacy risks

40%
Inadequate infrastructure

40%
Fast pace of technological change

Latin America Smart scorecard

Cities in Latin America have the lowest average annual technology budget of any region, at just $5.4m. However, they invest heavily into three key technologies: cloud, mobile, and IoT. All other technologies are used far less. Over the next three years, Latin American cities intend to boost investments substantially.

Latin American cities are not focusing sufficiently on cybersecurity threats: they lag those in all regions except Africa in their preparedness for cyberattacks, with just 13% saying they are well prepared. They will stay near the bottom of the list in terms of cybersecurity investments planned for the next three years. Of note, Latin American cities make strong use of certain types of data to support their operations, especially administrative, citizen usage, and IoT data.

Of the Latin American cities surveyed, five are beginners in smart city maturity, while 10 are intermediates. None is a leader. Bogota, however, is an example of a city that is making solid progress on several fronts, including in investing in smart solutions such as data management systems to address transport and mobility problems—particularly helpful in a city ranked as one of the world's worst in traffic congestion.

Biggest investments now		Biggest increase over next 3 years	
Cloud	100%	AI	+40%
Mobile, apps	93%	Biometrics	+26%
IoT	80%	Drones/robots	+26%
Biometrics	47%	IoT; data warehouses, lakes	+20%
Blockchain; AI; data management	40%	Telematics; online collaborative tools	+20%

Average annual tech budget

Large city: $7m

Small city: $2.5m

Average $5.4 m

Average ROI on digital infrastructure investments

Data most used now		Biggest rise in data in 3 years	
Administrative	100%	Crowd-sourced	+33%
Citizen usage data	67%	Real-time	+33%
IoT	60%	Business	+27%
Behavioral	53%	Peer-based	+20%
Crowd-sourced	47%	Geospatial; predictive	+20%

LATAM behind in engaging citizens	All cities	LATAM	Diff.
Using digital communication	72%	53%	-19%
Personalizing digital platforms	62%	47%	-15%
Appointing Chief Citizen Experience Officer	12%	0%	-12%
Involving disadvantaged	49%	40%	-9%
Having citizens help set goals	49%	47%	-2%

Latin America City indicators

City	SDG in plans	SDG progress	Tracks SDGs	SDG department	Smart City maturity
Asuncion	Yes	Advancer	Yes	No	Intermediate
Bogota	Yes	**Sprinter**	Yes	Yes	Intermediate
Buenos Aires	Yes	**Sprinter**	No	No	Intermediate
Colima	Yes	Advancer	Yes	No	Beginner
Lima	Yes	Advancer	Yes	Yes	Beginner
Mexico City	Yes	**Sprinter**	Yes	No	Beginner
Monterrey	Yes	Advancer	No	No	Intermediate
Montevideo	Yes	**Sprinter**	Yes	No	Intermediate
Panama City	Yes	Advancer	Yes	No	Intermediate
Quito	Yes	Advancer	Yes	No	Intermediate
Rio de Janeiro	Yes	Advancer	Yes	No	Intermediate
San Jose	Yes	Advancer	Yes	Yes	Beginner
San Juan	No	Implementer	No	No	Beginner
Santiago de Chile	Yes	Advancer	Yes	Yes	Intermediate
Sao Paulo	Yes	**Sprinter**	Yes	Yes	Intermediate

MENA SDG scorecard

Cities in MENA have made huge strides in achieving their goals, with 63% having made good progress—trailing only Europe and North America. And 90% have incorporated the SDGs into their plans. Even more impressive, MENA cities have made these achievements while operating in a region where policies and regulations can lack uniformity and local top-tier providers can be hard to find.

All MENA cities surveyed report having made considerable progress in poverty alleviation—no other region has reported such widespread progress on any of the SDGs. At the same time, cities in MENA report the lowest share (10%) in reducing inequality, a major trouble spot in the region where extreme income inequality is leading to polarization and destabilization.

Of the 10 MENA cities in the survey, eight are classified as advancers, one as an early implementer (Cairo), and one as a sprinter (Amman).

Average ROI

Safety & security	Energy & water	Environment
Crowdsourced crime reporting **8.75%**	Smart water meters **6.78%**	Predictive analytics for flood warning **7.50%**
In-car/body cameras for police **8.00%**	Microgrids/distributed generation **6.00%**	Real-time air quality monitoring **5.70%**
Smart ground surveillance **5.25%**	Smart grids/smart meters **5.22%**	Use of data to optimize waste collection **4.88%**

Most progress on SDGs

No poverty	Partnerships for the goals	Affordable & clean energy
100%	**90%**	**90%**

Least progress on SDGs

Reduced inequalities	Peace & justice institutions	Responsible consumption
10%	**40%**	**40%**

Key partnerships in 3 years		Top domain investments in 3 years	
Multilateral organizations	**70%**	Energy, water; economy	**70%**
Federal government	**70%**	Public safety; living & health	**60%**
Consultants, outsourcing; corporations	**60%**	Digital infrastructure	**60%**

Top SDG funding now		Top SDG funding in 3 years	
Private-sector financing	**100%**	Government based	**90%**
Public funding & grants	**80%**	Private-sector financing	**70%**
Government based	**80%**	Vendor financing; philanthropic	**60%**

Top challenges to SDGs next 3 years

80%
Complex policies & regulations

60%
Finding right suppliers, partners

50%
Pace of digital change

40%
Unclear implementation roadmap

40%
Data security & privacy risks

MENA Smart scorecard

Cities in MENA are advancing steadily in smart city innovation. They are making large investments in several digital technologies and will increase those outlays over the next three years. Yet their average annual technology budget, at $12.9m at present, lags that of North America and Europe substantially.

Cities in this region invest the most in cloud, IoT, biometrics, and mobile. Over the next three years, they will boost their spending on more sophisticated technologies such as online collaborative tools, data warehouses, digital twins, AI, blockchain, edge computing, and AR/VR. Cities in MENA are heavier users of biometrics and crowd-sourced data than those in any other regions.

Forty percent of cities in MENA say they are well or very well prepared for cybersecurity threats, placing them behind only North American and European cities. Although they plan to boost cybersecurity investments, they will continue to lag those regions in outlays over the next three years.

Eight of the MENA cities in the study are intermediate in smart city maturity, while one, Abu Dhabi, is a leader, and one, Tunis, is a beginner. Abu Dhabi's status reflects the Emirate's high-profile strategy to make its capital city the leading technology and innovation hub in the Middle East.

Average ROI on digital infrastructure investments

Biggest investments now		Biggest increase over next 3 years	
Cloud	**100%**	Online collaborative tools	**+50%**
IoT	**90%**	Data warehouses, lakes	**+30%**
Biometrics	**90%**	Digital twins	**+30%**
Mobile, apps	**80%**	AI; blockchain	**+20%**
RPA; digital dashboards; AI	**70%**	Edge computing; AR/VR	**+20%**

Average annual tech budget

Large city: $13.1m

Small city: $17.6m

Average $12.9 m

Data most used now		Biggest rise in data in 3 years	
IoT	**80%**	Predictive	**+50%**
Biometric	**80%**	Behavioral	**+40%**
Administrative	**80%**	Geospatial	**+30%**
Real-time; citizen usage	**50%**	Citizen satisfaction	**+30%**
Crowd-sourced	**50%**	Real-time	**+30%**

MENA behind in engaging citizens	All cities	MENA	Diff.
Personalizing digital platforms	62%	50%	-12%
Appointing Chief Citizen Experience Officer	12%	0%	-12%
Encouraging use of digital tools	31%	20%	-11%
Involving the disadvantaged	40%	49%	-9%
Demonstrating value	40%	47%	-7%

MENA City indicators

City	SDG in plans	SDG progress	Tracks SDGs	SDG department	Smart City maturity
Abu Dhabi	Yes	Advancer	No	No	**Leader**
Amman	Yes	**Sprinter**	Yes	Yes	Intermediate
Cairo	Yes	Implementer	Yes	No	Intermediate
Doha	Yes	Advancer	Yes	Yes	Intermediate
Jerusalem	Yes	Advancer	Yes	No	Intermediate
Kuwait City	Yes	Advancer	Yes	Yes	Intermediate
Manama	No	Advancer	No	No	Intermediate
Rabat	Yes	Advancer	Yes	Yes	Intermediate
Riyadh	Yes	Advancer	Yes	Yes	Intermediate
Tunis	Yes	Advancer	No	No	Beginner

North America SDG scorecard

North American cities lead the way in adopting the SDGs, with 95% having incorporated them into their plans. They rank only behind European cities in their progress across the SDGs (71% on average vs. 77% in Europe).

Cities in North America have made the most headway on industry and innovation, sustainable cities, health and well-being, decent work and economic growth, and life on land—areas in which 85%-90% have made considerable progress. Yet cities in North America have made the least progress of any cities globally on climate action.

Most North American cities surveyed, 30, qualify as advancers in SDG development; only two (Allentown and Pearland) are early implementers. Eight are sprinters—those that have made the most progress.

Average ROI

Safety & security	Energy & water	Environment
Communications systems **6.85%**	Smart grids/smart meters **6.56%**	Real-time air quality monitoring **6.12%**
Facial recognition & biometrics **6.81%**	Smart water meters **6.09%**	Real-time water quality monitoring **5.36%**
Smart ground surveillance **6.74%**	Apps to track energy use **5.82%**	Data to optimize waste collection **4.95%**

Most progress on SDGs

Industry, innovation	Sustainable cities; health & well-begin	Decent work & economic growth; life on land
90%	**85%**	**85%**

Least progress on SDGs

Climate action	Partnerships for the goals	Reduced inequities
10%	**45%**	**53%**

Key partnerships in 3 years		Top domain investments in 3 years	
Federal government	**80%**	Economy, trade, industry	**75%**
State/provincial government	**75%**	Mobility & transport; living & health	**73%**
Multilaterals	**73%**	Public safety	**68%**

Top SDG funding now		Top SDG funding In 3 years	
Government based	**90%**	Crowdfunding from public	**83%**
Private-sector financing	**83%**	Government based	**78%**
User fees/taxes	**68%**	Private-sector financing	**70%**

Top SDG challenges next 3 years

68%
Complex policies & regulations

60%
Data security & privacy

58%
Finding right suppliers or partner

43%
Fast pace of technological change

38%
Need to focus on basic services

North America Smart scorecard

With the largest average technology budget of any region, at $33.2m, it is no wonder that North American cities are the most digitally advanced in the world. They make the largest technology investments overall, with more than 90% of cities reporting big outlays in IoT, mobile, and cloud, and only slightly less in AI. They will continue to be leaders in digital investment over the next three years, although cities in Europe and MENA will start to catch up.

Given their digital sophistication, North American cities are the most ahead in readiness for cyberattacks (with 58% well or very well prepared). However, more Asian than North American cities plan large investments in cybersecurity over the next three years.

Fifteen North American cities in our survey qualify as smart innovation leaders, while 21 are intermediates. Four are beginners. Six are classified as Cities 4.0: Baltimore, Boston, Los Angeles, New York, Orlando, and Philadelphia. These have distinguished themselves by being far ahead on both the SDGs and smart innovation.

Orlando is one city that sets an example for others: it follows best practices such as building partnerships with universities and non-profits, collaborating with neighboring cities, tracking progress via voluntary local reviews, addressing the digital divide, and using data to assess its citizens' needs.

Biggest investments now		Biggest increase over next 3 years	
IoT	98%	Digital twins	+32%
Mobile, apps	95%	Data warehouses, lakes	+25%
Cloud	95%	Telematics	+18%
Biometrics	88%	Blockchain	+15%
AI	83%	Digital dashboards	+10%

Average annual tech budget

Large city: $142m

Small city: $26.9m

Average: $33.2m

Average ROI on digital infrastructure investments

Low-powered WAN, 7.37%
Smart stations, 7.29%
Cloud technology, 6.92%
Public Wi-Fi , 6.71%
Municipal broadband , 6.88%
Edge-computing, 6.45%
IoT, 6.23%
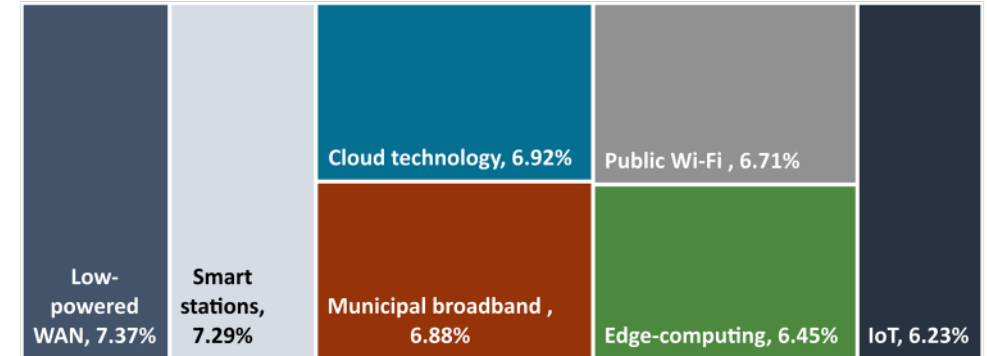
Data most used now		Biggest rise in data in 3 years	
IoT	85%	Predictive	+30%
Administrative	75%	Channel usage	+25%
Behavioral	68%	Real-time	+25%
Citizen satisfaction	58%	Crowd-sourced; business	+22%
Citizen usage	58%	Peer-based	+20%

North America ahead in engaging citizens	All cities	N Amer	Diff.
Encouraging use of digital tools	31%	43%	12%
Appointing Chief Citizen Experience Officer	12%	23%	11%
Involving disadvantaged	49%	58%	9%
Having citizens help set goals	49%	58%	9%
Using digital communications	72%	80%	8%

North America City indicators

City	SDGs in plans	SDGs progress	SDGs monitoring	SDGs department	Smart maturity
Allentown	No	Implementer	No	No	Beginner
Atlanta	Yes	Advancer	Yes	No	**Leader**
Austin	Yes	Advancer	Yes	No	Intermediate
Baltimore	Yes	**Sprinter**	Yes	Yes	**Leader**
Boston	Yes	**Sprinter**	Yes	Yes	**Leader**
Brantford	Yes	Advancer	Yes	No	Beginner
Calgary	Yes	Advancer	Yes	Yes	Intermediate
Chicago	Yes	Advancer	Yes	Yes	**Leader**
Cincinnati	Yes	Advancer	Yes	Yes	Intermediate
Columbus	Yes	Advancer	Yes	No	**Leader**
Denver	Yes	Advancer	Yes	No	Intermediate
Detroit	Yes	Advancer	Yes	No	**Leader**
Edmonton	Yes	Advancer	No	Yes	Intermediate
El Paso	Yes	Advancer	Yes	Yes	Intermediate
Honolulu	Yes	Advancer	Yes	Yes	Intermediate
Kansas City	Yes	Advancer	Yes	No	Intermediate
Los Angeles	Yes	**Sprinter**	Yes	Yes	**Leader**
Manchester	Yes	Advancer	Yes	No	Beginner
Montreal	Yes	Advancer	Yes	No	**Leader**
Nashville	Yes	Advancer	Yes	No	Intermediate

City	SDGs in plans	SDGs progress	SDGs monitoring	SDGs department	Smart maturity
New York	Yes	**Sprinter**	Yes	Yes	**Leader**
Newark	Yes	Advancer	Yes	No	Intermediate
Oakland	Yes	Advancer	Yes	Yes	Intermediate
Orlando	Yes	**Sprinter**	Yes	Yes	**Leader**
Pearland	No	Implementer	No	No	Beginner
Philadelphia	Yes	**Sprinter**	Yes	Yes	**Leader**
Phoenix	Yes	Advancer	Yes	Yes	Intermediate
Pittsburgh	Yes	**Sprinter**	Yes	No	Intermediate
Portland	Yes	Advancer	Yes	Yes	Intermediate
Quebec	Yes	**Sprinter**	Yes	No	Intermediate
Raleigh	Yes	Advancer	Yes	Yes	Intermediate
San Antonio	Yes	Advancer	Yes	Yes	Intermediate
San Diego	Yes	Advancer	Yes	No	Intermediate
San Francisco	Yes	Advancer	Yes	Yes	Intermediate
Seattle	Yes	Advancer	Yes	No	**Leader**
Toronto	Yes	Advancer	Yes	Yes	**Leader**
Tulsa	Yes	Advancer	Yes	No	Intermediate
Vancouver	Yes	Advancer	Yes	Yes	**Leader**
Victoria	Yes	Advancer	Yes	Yes	Intermediate
Washington DC	Yes	Advancer	Yes	Yes	**Leader**

Cities 4.0 are highlighted in gray

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